Decision Rationale

**Total Maximum Daily Load of
Fecal Coliform for Hutton Creek**

I. Introduction

This document will set forth the Environmental Protection Agency's (EPA) rationale for approving the Total Maximum Daily Load (TMDL) of Fecal Coliform for Hutton Creek submitted for final Agency review on January 04, 2001 Our rationale is based on the TMDL submittal document to determine if the TMDL meets the following 8 regulatory conditions pursuant to 40 CFR §130.

1. The TMDLs are designed to implement applicable water quality standards.
2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
3. The TMDLs consider the impacts of background pollutant contributions.
4. The TMDLs consider critical environmental conditions.
5. The TMDLs consider seasonal environmental variations.
6. The TMDLs include a margin of safety.
7. The TMDLs have been subject to public participation.
8. There is reasonable assurance that the TMDLs can be met.

II. Background

Located in Washington County, Virginia, the overall Hutton Creek watershed [1] is approximately 11.2 square miles. The TMDL addresses 4.2 miles of Hutton Creek, from its headwaters to its confluence with the Middle Fork Holston. The Middle Fork Holston flows from southern Virginia to Tennessee.

In response to Section 303 (d) of the Clean Water Act (CWA), the Virginia Department of Environmental Quality (VADEQ) listed 4.2 miles of Hutton Creek as being impaired by elevated levels of fecal coliform on Virginia's 1998 303 (d) list. Hutton Creek was listed for violations of Virginia's fecal coliform bacteria standard for primary contact. The Creek was listed as being benthically impaired as well. Fecal Coliform is a bacterium which can be found within the intestinal tract of all warm blooded animals. Therefore, fecal coliform can be found in the fecal wastes of all warm blooded animals. Fecal coliform in itself is not a pathogenic organism. However, fecal coliform indicates the presence of fecal wastes and the potential for the existence of other pathogenic bacteria. The higher concentrations of fecal coliform indicate

[1] The Hutton watershed is part of Middle Fork Holston hydrologic unit (No. 2070005)

the elevated likelihood of increased pathogenic organisms. Hutton Creek identified as watershed VAS-O05R, was given a high priority for TMDL development. Section 303 (d) of the Clean Water Act and its implementing regulations require a TMDL to be developed for those waterbodies identified as impaired by the State where technology-based and other controls do not provide for the attainment of Water Quality Standards. The TMDL submitted by Virginia is designed to determine the acceptable load of fecal coliform which can be delivered to Hutton Creek, as demonstrated by the Hydrologic Simulation Program Fortran (HSPF)[2], in order to ensure that the water quality standard is attained and maintained. These levels of fecal coliform will ensure that the Primary Contact usage is supported. HSPF is considered an appropriate model to analyze this watershed because of its dynamic ability to simulate both watershed loading and receiving water quality over a wide range of conditions.

The TMDL analysis allocates the application/deposition of fecal coliform to land based and instream sources. For land based sources, the HSPF model accounts for the buildup and washoff of pollutants from these areas. Buildup (accumulation) refers to all of the complex spectrum of dry-weather processes that deposit or remove pollutants between storms.[3] Washoff is the removal of fecal coliform which occurs as a result of runoff associated with storm events. These two processes allow the HSPF model to determine the amount of fecal coliform from land based sources which is reaching the stream. Point sources and wastes deposited directly to the stream were treated as direct deposits. These wastes do not need a transport mechanism to allow them to reach the stream. The allocation plan calls for the reduction in fecal coliform wastes delivered by cattle in-stream and septic systems.

Table #1 summarizes the specific elements of the Hutton TMDL.

Parameter	TMDL(cfu/yr)	WLA(cfu/yr)	LA(cfu/yr)	MOS^1 (cfu/yr)
Fecal Coliform	1.35×10^{15}	0	1.28×10^{15}	6.75×10^{13}

1 Virginia includes an implicit MOS by identifying the TMDL target as achieving the total fecal coliform water quality concentration of 190 cfu/100ml as opposed to the WQS of 200 cfu/ml. This can be viewed explicitly as a 5% MOS.

The United States Fish and Wildlife Service has been provided with a copy of this TMDL.

III. Discussion of Regulatory Conditions

---

[2]Bicknell, B.R., J.C. Imhoff, J.L. Little, and R.C. Johanson. 1993. Hydrologic Simulation Program-FORTRAN (HSPF): User's Manual for release 10.0. EPA 600/3-84-066. U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, GA.

[3]CH2MHILL, 2000. Fecal Coliform TMDL Development for Cedar, Hall, Byers, and Hutton Creeks Virginia,

EPA finds that Virginia has provided sufficient information to meet all of the 8 basic requirements for establishing a fecal coliform TMDL for Hutton Creek. EPA is therefore approving this TMDL . Our approval is outlined according to the regulatory requirements listed below.

1) The TMDL is designed to meet the applicable water quality standards.

Virginia has indicated that excessive levels of fecal coliform due to nonpoint sources (directly deposited into the Creek) have caused violations of the water quality standards and designated uses on Hutton Creek. The water quality criterion for fecal coliform is a geometric mean 200 cfu (colony forming units)/100ml or an instantaneous standard of no more than 1,000 cfu/100ml. Two or more samples over a 30-day period are required for the geometric mean standard. Most of the streams monitored by Virginia are sampled once in a 30-day period. Therefore, most violations of the State's water quality standard are due to violations of the instantaneous standard.

The HSPF model is being used to determine the fecal coliform deposition rates to the land as well as loadings to the stream from point and other direct deposit sources necessary to support the fecal coliform water quality criterion and primary contact use. The following discussion is intended to describe how controls on the loading of fecal coliform to Hutton Creek will ensure that the criterion is attained.

The TMDL modelers determined the fecal coliform production rates within the watershed. Information was attained from a wide array of sources on the farm practices in the area (land application rates of manure), the amount and concentration of farm animals, point sources in the watershed, animal access to the stream, wildlife in the watershed and their fecal production rates, land uses, weather, stream geometry, etc. This information was put into the model. The modelers also assigned values to several parameters that affect the transport of fecal coliform to the stream. The modelers adjusted the parameters to insure a correspondence between observed and simulated conditions

The hydrologic component of the model for all the Middle Fork Holston TMDLs (Cedar, Byers, Hutton, and Hall Creeks) was developed based on Groseclose Creek and then transferred to each individual watershed. This was done because there were no stream gages on the other waters. When the simulated data on Groseclose accurately reflected the observed flow data the model was considered complete and transferred to the other watersheds. The hydrologic parameters were adjusted to match the conditions in each watershed. The model was calibrated to the impaired watersheds by comparing simulated flow results to observed flows (monthly samples).

EPA believes that using HSPF to model and allocate fecal coliform loading, will ensure that the designated uses and water quality standards will be attained and maintained for Hutton Creek.

2) The TMDL includes a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

Virginia indicates that the total allowable load of fecal coliform is the sum of the loads allocated to land based, precipitation driven nonpoint source areas (impervious areas, built-up area, distributed area, field crop, forest, hayfield, improved pasture, overgrazed pasture, poor pasture, row crop, strip crop), directly deposited nonpoint sources of fecal coliform (cattle in-stream and failed septic systems), and point sources. Activities such as the application of manure, fertilizer, and the direct deposition of wastes from grazing animals are considered fluxes to the land use categories. The actual value for the total fecal load can be found in Table 1 of this document. The total allowable load is calculated on an annual basis due to the nature of HSPF model.

Waste Load Allocations

Virginia has stated that there are no point sources discharging to Hutton Creek. EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA pursuant to 40 CFR 130.7." Furthermore, EPA has authority to object to the issuance of any NPDES permit that is inconsistent with the WLAs established for that point source.

Load Allocations

According to federal regulations at 40 CFR 130.2 (g), load allocations are best estimates of the loading, which may range form reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings, VA DEQ used the HSPF model to represent the Hutton Creek watershed. The HSPF model is a comprehensive modeling system for simulation of watershed hydrology, point and nonpoint loadings, and receiving water quality for conventional pollutants and toxicant[4]. More specifically HSPF uses precipitation data for continuous and storm event simulation to determine total fecal loading to Hutton Creek from impervious areas, built-up area, distributed area, field crop, forest, hayfield, improved pasture, overgrazed pasture, poor pasture, row crop, strip crop. The total land loading of fecal coliform is the result of the application of manure, direct deposition from cattle and wildlife (geese and deer) to the land, fecal coliform production from

[4] Supra, footnote 2.

dogs, and best management practices (which have already been implemented on several farms reduce the loading of fecal coliform and sediment to streams).

In addition, VADEQ recognizes the significant loading of fecal coliform from cattle in-stream and failed septic systems. These two sources are not dependent on a transport mechanism to reach a surface waterbody and therefore can impact water quality during low and high flow events.

It should be noted that an extensive amount of BMPs (Best Management Practices) have been implemented within Cedar Creek , Hall/Byers Creek, and Hutton Creek. BMPs have been installed in approximately 17% of the Hutton Creek watershed. Based on the model these BMPs have reduced the fecal coliform loading by 12.2%.

There are three weather stations in the area around the study area. The closest weather station (Helton, NC) had a significantly larger annual rainfall average (53 inches) than the watershed in question. It was decided that the use of this watershed would bias the model toward regulating nonpoint sources (runoff related wastes) and therefore not used. The study area had a mean annual rainfall of 43 inches. Weather stations in Bristol and Wytheville were used because their mean annual rainfall (41 and 39 inches respectively) was closer to the annual rainfall of the study area. The watershed is located halfway between these weather stations. DEQ averaged the rainfall data from these two stations and applied the computed data to the model. This interpretation can affect the model because there maybe some differences between the actual storm event and the computed event. Table 3 illustrates the load allocation for the land application of fecal coliform.

Table 3 - Load allocation for the land application of fecal coliform

Source	Existing Load(cfu/yr)	Allocated Load(cfu/yr)	Percent Reduction
Impervious Areas	4.26E+13	4.26E+13	0%
Built-up Area	1.40E+12	1.40E+12	0%
Forest	1.33E+12	1.33E+12	0%
Hayfield	7.33E+12	6.60E+12	10%
Improved Pasture	9.61E+13	8.65E+13	10%
Overgrazed Pasture	8.29E+14	8.29E+14	0%
Poor Pasture	2.35E+14	2.35E+14	0%
Row Crop	6.45E+13	6.45E+13	0%
Strip Crop	5.12E+12	5.12E+12	0%
Failed Septic Systems	1.03E+12	0.0	100%

Cattle In-Stream	2.59E+13	0.0	100%

3) The TMDL considers the impacts of background pollution.

Fecal coliform loads from deer and geese were considered background loading and were incorporated into the model.

4) The TMDL considers critical environmental conditions.

EPA regulations at 40 CFR 130.7 (c)(1) require TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Hutton Creek is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[5]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence but when modeled to, insure that water quality standards will be met for the remainder of conditions. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum. Virginia's standards are designed to be applied during all flow events.

The sources of bacteria for these stream segments were mixtures of dry and wet weather driven sources. Therefore, the critical condition for Hutton Creek was represented as a typical hydrologic year.

5) The TMDLs consider seasonal environmental variations.

Seasonal variations involve changes in stream flow as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flow normally occurs during the colder period of winter and in early spring from snow melt and spring rain, while seasonally low flow typically occurs during the warmer summer and early fall drought periods. Consistent with our discussion regarding critical conditions, the HSPF model and TMDL analysis will effectively consider seasonal environmental variations.

---

[5]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. Margins of safety may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the wasteload allocation, load allocation, or TMDL.

Virginia includes an explicit margin of safety by establishing the TMDL target water quality concentration for fecal coliform at 190 cfu/ 100mL, which is more stringent than Virginia's water quality standard of 200 cfu/100 mL. This would be considered an explicit 5% margin of safety.

7) The TMDLs have been subject to public participation.

This TMDL was subject to a number of public meetings. Three public meetings were held in Glade Spring. The meetings were held on November 09, 1999, January 27, 2000, and March, 2000 and were intended to address initial questions and concerns regarding outreach issues and the TMDL process.

The first public meeting was held on November 9, 1999 in Glade Spring and was announced in the Washington County News on October 27, 1999 and the Virginia Register on November 08, 1999. The second public meeting was announced in the Virginia Register on December 28, 1999, the Washington County News on January 19, 2000, and the Bristol Herald Courier on January 23, 2000. The March 30, 2000, public meeting was announced in the March 13, 2000 Virginia Register and the local papers. No written comments or responses were provided by VA DEQ with this submission.

8) There is a reasonable assurance that the TMDL can be met.

EPA requires that there be a reasonable assurance that the TMDL can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the Clean Water Act, commonly referred to as the Nonpoint Source Program. Additionally, Virginia's Unified Watershed Assessment, an element of the Clean Water Action Plan, could provide assistance in implementing this TMDL.